

Weapons of Mass Destruction Terrorism Preparedness & Response

Chemical & Biological Arms Control Technologies: Applications to Homeland Defense

Presented By:

Cathleen M. Hoefler

**Technology Development (TD) Directorate
Chemical and Biological (CB) Arms Control Technology Branch**

May 2, 2001

DTRA

Report Documentation Page		
Report Date 02May2001	Report Type N/A	Dates Covered (from... to) - -
Title and Subtitle Chemical & Biological Arms Control Technologies: Applications to Homeland Defense		Contract Number
		Grant Number
		Program Element Number
Author(s) Hoefler, Cathleen		Project Number
		Task Number
		Work Unit Number
Performing Organization Name(s) and Address(es) Technology Development (TD)Directorate Chemical and Biological (CB) Arms Control Technology Branch		Performing Organization Report Number
Sponsoring/Monitoring Agency Name(s) and Address(es) NDIA (National Defense Industrial Association) 211 Wilson Blvd, STE. 400 Arlington, VA 22201-3061		Sponsor/Monitor's Acronym(s)
		Sponsor/Monitor's Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes Proceedings from the Weapons of Mass Destruction (WMD) Terrorism Preparedness & Response Conference & Exhibition, 30 April - 2 May 2001 Sponsored by NDIA		
Abstract		
Subject Terms		
Report Classification unclassified		Classification of this page unclassified
Classification of Abstract unclassified		Limitation of Abstract UU
Number of Pages 18		

CW/BW ARMS CONTROL TECHNOLOGY (TDCB) MISSION

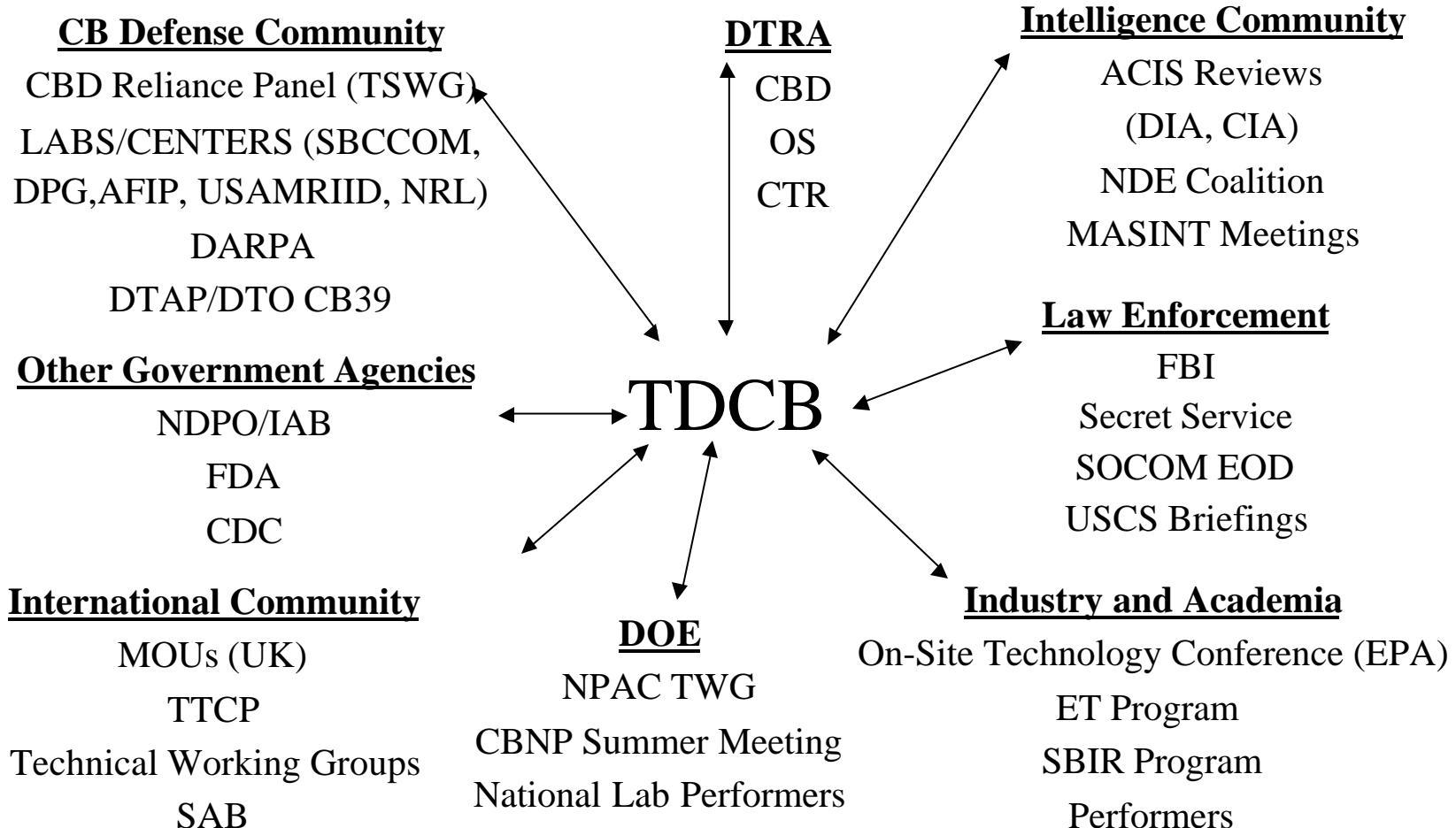
Develop technology needed for DoD activities involving CW and BW arms control & non-proliferation activities, to include implementation, verification, and inspections.

- ◆ Provide technical support and data analysis for arms control negotiations
- ◆ Provide technology capability and support to enable the U. S. Government to protect its rights and comply with arms control agreements

CW/BW ARMS CONTROL TECHNOLOGY MISSION PRIME DIRECTIVE

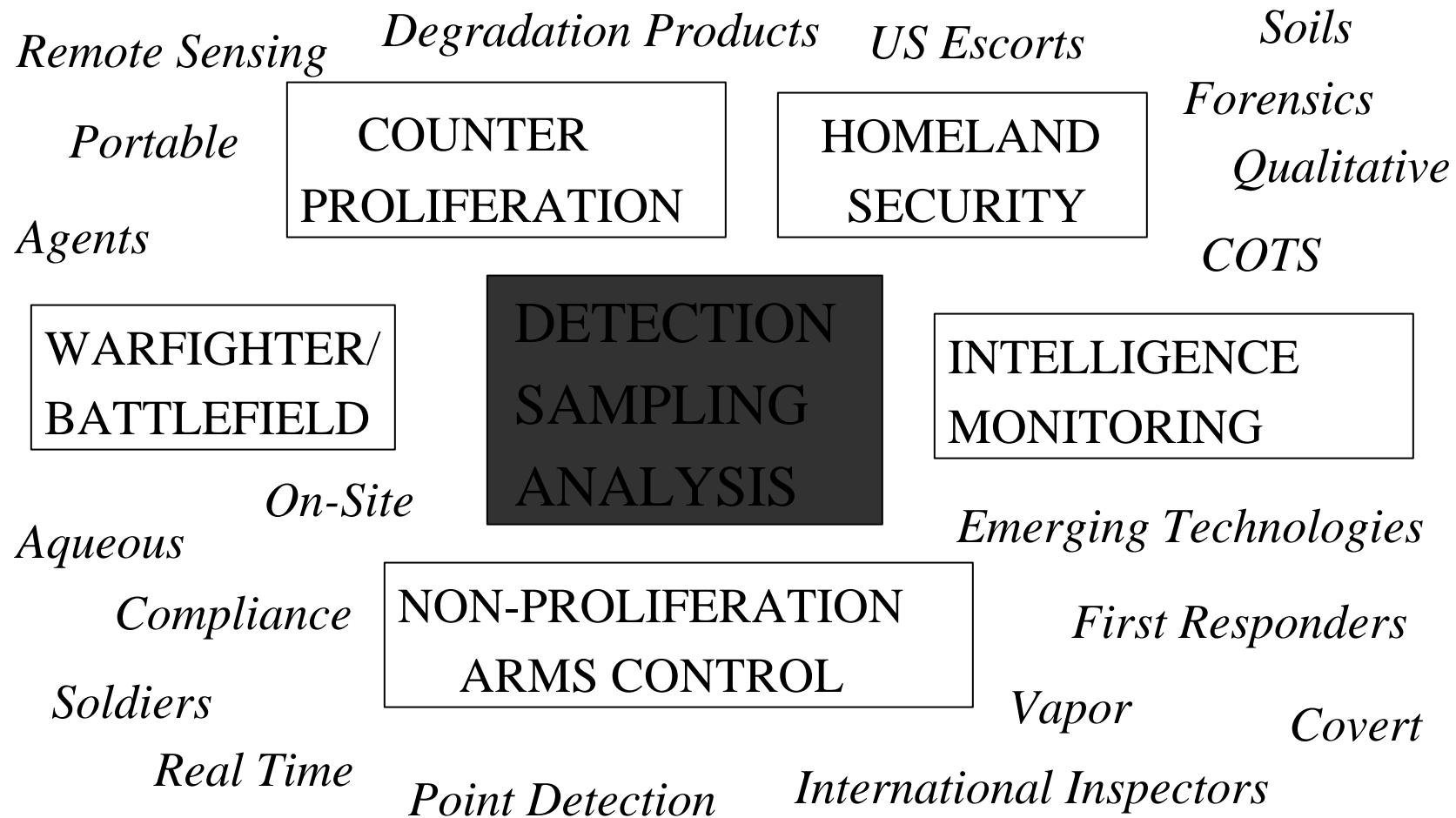
♦Conduct R&D efforts to enhance data analysis and technology capabilities used during US participation in CW and BW Arms Control and Non-Proliferation activities to not present a threat to DoD equities and national security interests

TECHNOLOGY INTERFACE



DTRA

COMMON REQUIREMENT CORE



DTRA

ARMS CONTROL TECHNOLOGY PROGRAM DRIVERS

Treaty Provisions

Prohibited Items

Matrices

Inspection Type

Time Constraints

Detection Limits

User Requirements

Portability

Size

Operability

Safety

Speed

US Law/Policy

Regulatory Restrictions

Ratification Provisions

Export Control

Trade

*First Responder Technology Drivers

CW and BW TECHNICAL INFORMATION PRODUCTS

- Objective: Support OSD Policy and US Delegations with data & analysis. Identify technology gaps

- Payoff: Sound technology development, DoD equities protected

- Challenges:

CWC: Senate Conditions (restrictions) 4 & 18

BWC: Highly Bracketed Text (no agreement)

- Recent Progress/Plans:

R&D Compendium & Database Web Directory

CWC -Ad Hoc Group- BioMedical Samples

BWC - ABO Encyclopedia



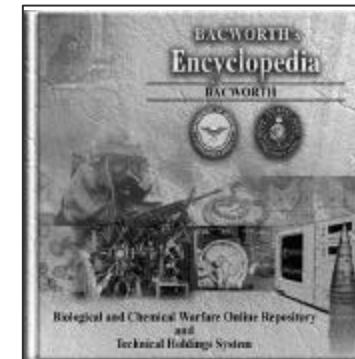
“APOTHECARY”

SEARCH:

Data Sources/SARIN/degradation

SEARCH:

CW Detection/Conductive Polymers



DTRA

MATRICES/ TARGETS FOR SCREENING



WASTE/DISCHARGE STREAMS

AIR/VAPOR



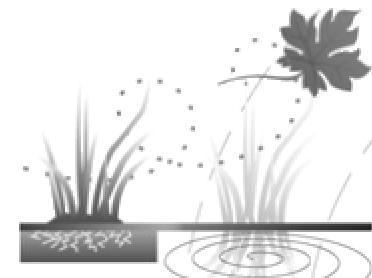
SOLIDS/VEGETATION/WIPES



DTRA

CWC: ON-SITE INSPECTION TECHNOLOGIES

Sample Collection/Screening



Sample Matrix
air
soil
water
vegetation

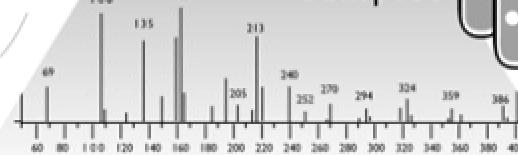
Non-Destructive Analysis



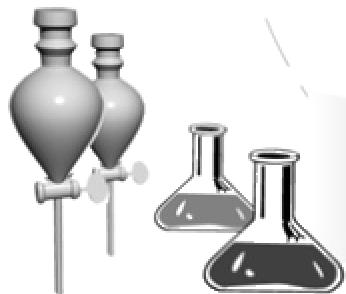
munitions

GC/MS Analysis

samples



Sample Preparation



Determinative Analysis

DTRA

CW SCREENING TECHNOLOGIES

- Photo-Ionization MS - Fragment-Free/Primary Ion-T
- Low Power GC for S/P Detection - T
- Conductive Poly Sensor for Aq Matrices -D
- Conductive Poly Sensor: Air/H-space Screening-D
- Micro-Sensor Using Metal Oxide Coatings-D
- Automated Colorimetric Test Kit-F/D
- Wipe/Swipe Towel Using Colorimetric Enzyme-D
- GC/MIME:Pattern Recognition/Coated Materials-D

D -Development T-Test F -Field



CW SAMPLE COLLECTION & SCREENING

Technology Example

Objective: Meet requirement for rapid portable sample screening

- Matrix: Aqueous Samples
- Automated version of military test kits (M272/M256)
- Uses microfluidics to combine sample with reagents to change color based on presence of nerve agent
- Resulting color formation read by credit-card sized spectrophotometer
- Developer: Constellation Technology Corporation, Largo FL.



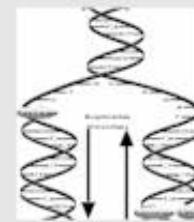
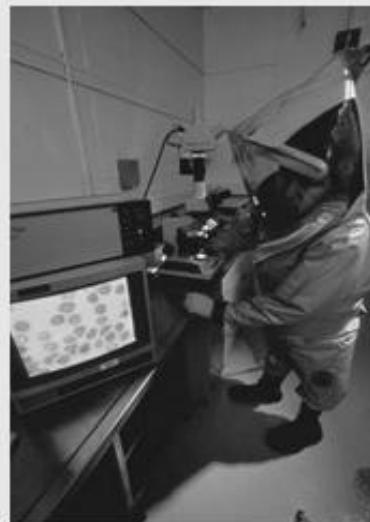
Pisces Prototype™

BWC: SAMPLING AND ANALYSIS TECHNOLOGIES

Sample Collection/Screening



Sample Preparation



Confirmatory Analyses

- Immunological
- Genetic (PCR)
- Classical Microbiology

DTRA

BW COLLECTION & SCREENING TECHNOLOGIES

- Hand Held Assay-D/T
- Polymerase Chain Reaction (PCR): Primers/Probes- D/T
- Cellular Function Based Assays-D
- Bacterial Endospore Detector T/D
- Optical Fiber Simultaneous Orthogonal Detection-D
- Magichip-T
- MALDI TOF-D

D-Development T -Testing

F-Field

DTRA

BW SAMPLE SCREENING

Technology Example

Objective: Develop rapid, sensitive, and portable system for the simultaneous orthogonal detection of multiple BW agents

- Matrix: Aqueous
- Direct detection and fluorescent methods measure captured targets.
- Results down to ng/ml levels for proteinaceous targets
- Developer: Luna Innovations



*Long Period Grating (LPG)-
Based Optical Fiber Fluorescent
Sensor*

DTRA

NON-DESTRUCTIVE EVALUATION TECHNOLOGIES

- Swept Frequency Acoustic Interferometry- F
- Advanced Non-Destructive Evaluation -T/D
- Next Generation ANDE-D
- Portable Isotopic Neutron Spectroscopy -F
- Mini-PINS - T/D
- Portable Neutron Generation System -D

D -Development T - Testing F-Field

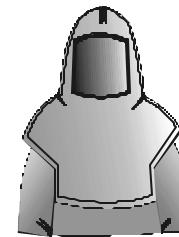
MULTIPLE TARGETS FOR NDE



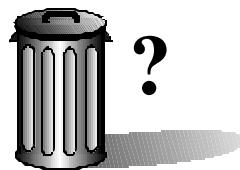
POLITICAL CONVENTIONS



MILITARY FACILITIES



FIRST RESPONSE HAZARDOUS EVENT

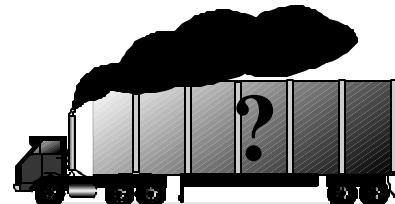


INTERNATIONAL SPORTING EVENTS



UN INSPECTED FACILITIES

EXCAVATION SITES



BORDERS & POEs



DTRA

NDE TECHNOLOGY PINS and ANDE SUMMARY

Objective: interrogate & identify sealed container contents rapidly in the field

- CDR for ANDE in June (LANL)
- Prototype Mini-PINS (INEEL)



ANDE: **Stand-off** acoustic based swept frequency interferometry

ANDE
(URAM)

PINS: Neutron beam molecular

PINS

identification.

GOAL: Approach real-time analysis

DTRA

Weapons of Mass Destruction Terrorist Response

Chemical & Biological Arms Control
Technologies:
Applications to Homeland Defense

Presented By:

Cathleen M. Hoefler

May 2, 2001

DTRA